# Board of County Commissioners

Leon County, Florida

# Workshop on Septic System Advisory Committee's Recommendations

## January 23, 2007
## 1:30 – 3:00 P.M.

**Leon County Board of County Commissioner Chambers**
**Leon County Courthouse, 5th Floor**

**This document distributed: Thursday, January 18, 2007 at 1:00 p.m.**

# Board of County Commissioners
# Workshop

Date of Meeting: January 23, 2007

Date Submitted: January 18, 2007

To: Honorable Chairman and Members of the Board

From: Parwez Alam, County Administrator
Homer Rice, Administrator, Leon County Health Department

Subject: Workshop on Septic System Advisory Committee's Recommendations

**Statement of Issue:**
This workshop presents information regarding the elevated nutrient levels in Wakulla Springs and reports the recommendations of the Septic System Advisory Committee with respect to the use of nutrient reduction onsite sewage treatment and disposal systems (OSTDS) proposed for use in the environmentally sensitive aquifer recharge area below the Cody Scarp.

**Background:**
In March of 2004 the Board of County Commissioners created the Septic System Advisory Committee as a fact finding / focus group committee in accordance with Board Policy 03-15. The committee's charge was to evaluate the adequacy of the existing County regulations regarding onsite systems, Article III, "On-Site Sewage Disposal Systems" of Chapter 18 "Utilities", Leon County Code of Laws. In June of 2005 the Board approved revisions to the onsite systems code and extended the Advisory Committee to review available data regarding nutrient loading from onsite systems with the intent to make recommendations for development standards for onsite systems in environmentally sensitive areas. Primary among these environmentally sensitive areas is the area of southern Leon County below the Cody Scarp.

**Analysis:**
Increasing concerns over rising levels of nitrogen in Wakulla Springs have prompted many groups, both public and private, to identify and evaluate the contributing sources of nitrogen with the intent of finding ways to reduce those levels. The Northwest Florida Water Management District report, "Nitrate Loading As An Indicator of Nonpoint Source Pollution In The Lower St. Marks-Wakulla Rivers Watershed", April 2002, identified six

principal sources of nitrogen: atmospheric deposition, wastewater treatment facilities, OSTDS, commercial fertilizer application, livestock and sinking streams. Of these the two most debated are the contributions from the City of Tallahassee waterwater treatment plant sprayfield and OSTDS.

According to the Northwest Florida Water Management District's report, of the six principal sources of nitrogen, the spray field accounts for 14 % and onsite systems 11%. If considering only those sources from human activities the relative contributions for the spray field and onsite systems are 29% and 22% respectively.

Determining precise values and levels of nitrogen contributed from each of the primary sources is extremely difficult at best. Unfortunately, only a few studies have been done in this area and the data available is limited. The Florida Department of Health in the "Wekiva Basin Onsite Sewage Treatment and Disposal System Study", December 2004, estimated the discharge of nitrogen for a family of four into a standard onsite system to be just under 25 pounds per year. There are approximately 4,300 onsite systems in the area of Leon County below the Cody Scarp. Using this figure the resulting estimated nitrogen production for these onsite systems would be 107,500 pounds of nitrogen per year. Estimates from the Northwest Florida Water Management District study for the spray field are 78,000 kg-N/yr or approximately 171,957 pounds of nitrogen per year. Natural, biological and chemical processes are known to reduce these nitrogen levels and as such, caution should be used when using these values to determine associated groundwater contamination from these sources.

Performance based onsite sewage disposal systems are currently available which will further reduce the levels of nitrogen discharged from onsite systems. These systems use various techniques and processes to reduce the nitrogen levels such as recirculation, drip irrigation, biofilters and other proprietary processes. Each will reduce the levels of nitrogen in the sewage effluent to varying degrees. Essential to the discussion of these systems is cost. Conventional onsite systems, septic tank and drainfields, average in cost from $5,500.00 to $7,500.00 according to the Department of Health Wekiva study. Comparable nutrient reduction systems are estimated to range from $7,500.00 to $9,000.00. These estimates do not include operating costs which include annual operating permits, increased electricity use or laboratory sampling. Local system estimates could also be higher based on system size requirements.

The use of performance based systems requires some type of operational management system. The U.S. Environmental Protection Agency has developed 5 model guidelines for the management of these systems.

Model 1: System Inventory and Awareness of Maintenance Needs
This relies on education of the system owner for proper maintenance. This system is suitable for conventional onsite systems and where environmental sensitivity is low.

Model 2: Management Through Maintenance Contracts
This model builds on Model 1 and manages onsite systems through management contracts. This model ensures that maintenance contracts with trained operators are maintained by the property owner. This model is appropriate where more complex system designs are needed to overcome site specific limitations such as small lots, slowly permeable soils or shallow seasonal water tables.

Model 3: Management Through Operating Permits
This model is necessary where more complex system designs are needed to achieve specific water quality criteria. This management system requires the property owner to acquire an operating permit. This provides the management entity a mechanism for continuous oversight of the system ensuring that the system's performance criteria are met. It also allows for mandating corrective actions and/or levying fines when those standards are not met. This model is used in more environmentally sensitive areas.

Model 4: Utility Operation and Maintenance
This model builds on Model 3 but instead of issuing the operating permit to the property owner the permit is issued to a public or private utility. Fees are established and the utility assumes the responsibility for the operation and maintenance of the onsite system. Ownership of the system remains with the property owner.

Model 5: Utility Ownership and Management
This model is similar to Model 4 above except that the ownership of the system is no longer with the property owner. The utility maintains total control of the operation and maintenance of the system.

An aquifer vulnerability assessment is currently proposed for Leon County. This assessment will identify areas of the county where the aquifer is most vulnerable. A similar assessment was conducted for the Wekiva Basin where primary, secondary and tertiary protection zones were delineated. More stringent development standards were recommended for each of these zones. The Florida Department of Health has proposed rule language to be included in Florida Administrative Code, Chapter 64E-6, which requires the use of performance based onsite systems in the Wekiva study area primary and secondary protection zones that either have a total nitrogen discharge limit of 3.0 milligrams per liter at 24 inches below the bottom of the drainfield, or utilize a performance based onsite system with a total nitrogen discharge limit of 10 milligrams per liter at the outlet of the tank and incorporate this with a drip irrigation drainfield installed no more than 9 inches below finished grade. These requirements are also applied to systems installed in the tertiary protection zone if severely limited soil is removed below the "O" horizon as a condition for permitting.

Increased levels of nitrogen have been associated with the degraded water quality of Wakulla Springs and the excessive growth of unwanted plant material. Limited studies have identified the primary sources for this nitrogen which include both sewage effluent

from onsite systems and the City of Tallahassee sewage treatment plant spray field. The specific nitrogen contributions for these two sources to Wakulla Springs are difficult to determine, however, collectively, they account for 51% of the nitrogen from human activities. It is therefore reasonable to assume that measures to reduce this input into the ground water are warranted and necessary. Considerations must also be given to cost effectiveness when looking at reduction method options. Toward that end the Septic Advisory Committee offers the following recommendations:

Recommendation 1: For all new OSTDS proposed for use south of the accepted geographical boundary of the Cody Scarp, require the use of OSTDS that are National Sanitation Foundation (NSF) certified to produce 10 milligrams per liter (mg/L) nitrogen at the outlet of the system tank in conjunction with drip irrigation drainfield.

Recommendation 2: Require U. S. Environmental Protection Agency Model 3 or higher management program for new OSTDS installed south of the accepted geographical boundary of the Cody Scarp.

**Options:**

1. Accept the report and recommendations of the Septic Advisory Committee.

2. Reconvene the Septic Advisory Committee and direct staff to work with that committee to begin drafting language to amend Chapter 18, Article II, Leon County Code of Laws incorporating the committee's recommendations.

3. Do not accept the report and recommendation of the Septic Advisory Committee.

4. Do not reconvene the Septic Advisory Committee and direct staff to work with that committee to begin drafting language to amend Chapter 18, Article II, Leon County Code of Laws incorporating the committee's recommendations.

5. Board Direction.

**Recommendation:**

Options #1 and #2

Attachments:

1. Wakulla Springs Working Group 2006 Accomplishments
2. Map of Wakulla Springs Basin
3. Performance-Based Nutrient Reduction Systems Power Point presentation

# 2006 Accomplishments
# Good things are happening in the Wakulla Spring Basin

**Working Groups**

- Wakulla Spring Basin Working Group quarterly meetings conducted February 2, May 2, and October 3.
- DCA conducts periodic Wakulla County Interagency Work Group meetings.

**Education**

- DOT and Leon County installed "Munson Slough Drains to Wakulla Spring" signs at slough crossings on state and county roads.
- Nitrogen Removing Septic Systems brochure being printed for Wakulla County homeowners.
- Spring Ambassador is educating landowners about groundwater protection.
- Tallahassee Democrat published 3 part series on Wakulla Spring protection.
- Tallahassee Democrat conducted Save Wakulla Spring Community Workshop.
- Three basin field trips conducted for the public.
- TAPP Water campaign underway to educate the public about water protection.
- City and County candidates commit to protect Wakulla Spring during Environmental Forum.
- Presentations given to Wakulla Chamber of Commerce, Florida Trail Association Native Nurseries, the Unitarian Church and Tallahassee Kiwanis.
- Native Nurseries' "Wakulla Spring Friendly Yards" class for 29 paid customers.
- A committee is developing the "Wakulla Spring Friendly Yards" concept.
- New web site created www.wakullasprings.org
- A hydrogeology workshop was conducted.
- Wakulla Springshed Educational Project for Riversprings Middle School provided field trips to Wakulla Springs and Leon Sinks.

**Wastewater Management**

- Settlement Agreement between City of Tallahassee, and DEP and Wakulla County, Florida Wildlife Federation, Joe Glisson and the Attorney General signed Dec. 19th.
- City will upgrade to AWT to reduce nitrate to 3 mg/L.
- City discontinued fertilizer applications on the southeast sprayfield.
- City removed livestock from the southeast sprayfield.
- City discontinued land application of biosolids.
- Working Group Septic Tanks Committee developed new action items Nov. 7th.

**Stormwater Management**

- City of Tallahassee approved funding for Stormwater Pollution Reduction Program (SPRP) to generate additional $60 million over 20 years to improve stormwater quality.
- The City's commitment to the SPRP was formalized in amendments to the Comprehensive Plan.
- Seven new City retrofit stormwater facilities underway or recently completed.
- Construction of two City stormwater facilities, associated with Blue Print 2000, is underway.

**Land Use Planning**

- Wakulla County Commission to consider approval of development standards to protect water quality including requiring nitrogen removing septic systems.
- City of Tallahassee and Leon County accepted Infrastructure Phasing Report which includes recommendations related to springs protection.
- Leon County's Aquifer Vulnerability Assessment to be completed July 2007. (LAVA mapping)
- Wakulla County's Aquifer Vulnerability Assessment to be completed July 2007.

**Research and Monitoring**

- Hazlett-Kincaid dye trace study confirmed connection of southeast sprayfield to Wakulla Spring.
- Fourteen research and monitoring projects are being conducted in the basin by agencies and corporations at a cost of approximately $1,475,000.
- WKPP divers have explored and mapped additional conduits in three cave systems in the basin.

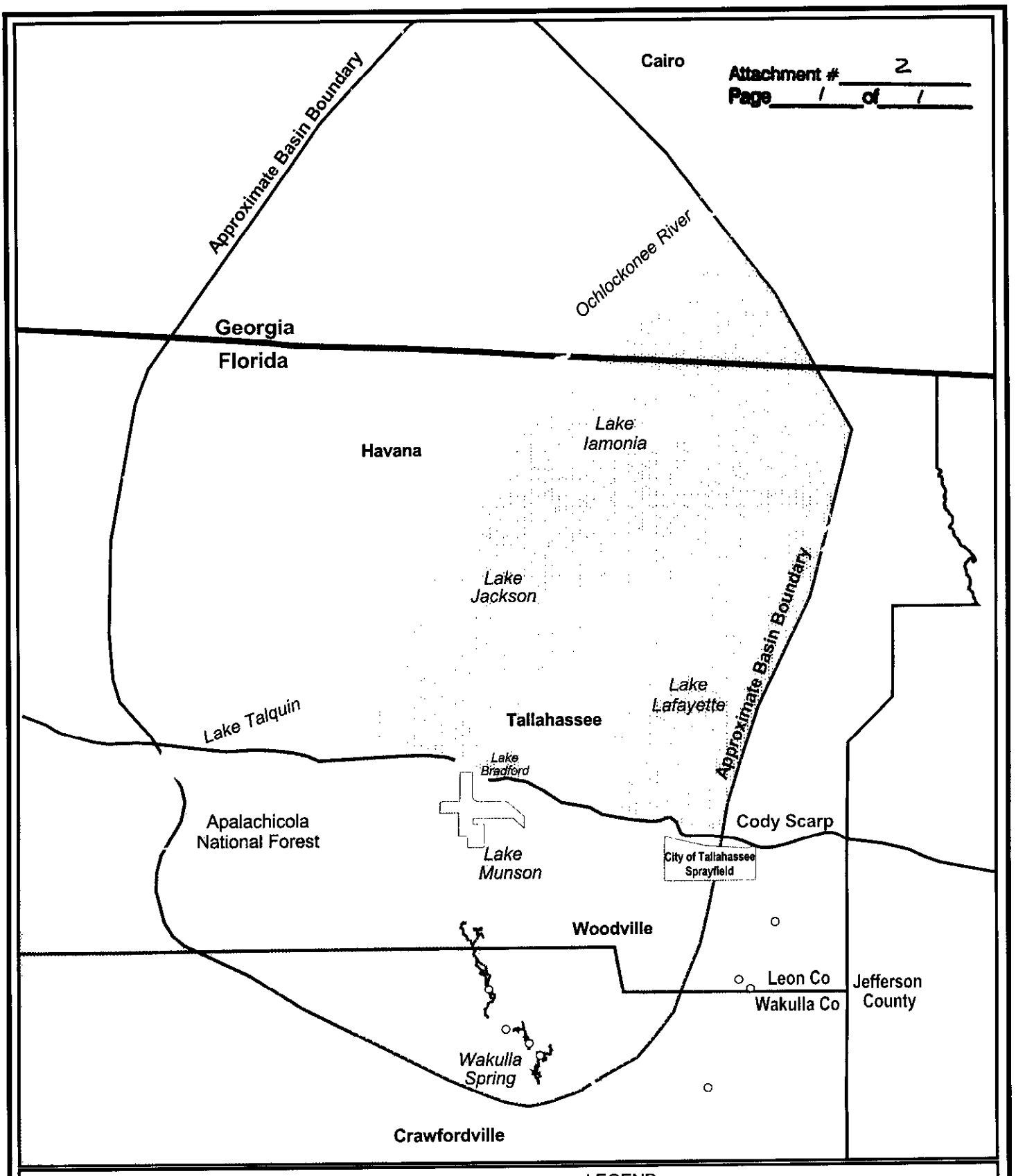
**Best Management Practices**

- A team of experts has recommended BMP's to St Joe for the Southside DRI.
- Homeowners are being encouraged to have Wakulla Spring Friendly Yards.

**Management**

- USFS controlled erosion on national forest roads to protect water quality of Fisher and Black Creeks.
- Clean-ups were conducted at Cherokee and Gremlin Sinks.
- YMCA Camp Indian Spring has restored the spring.

12/31/06




# Wakulla Spring Basin

Map 2 of 2

N

4 0 4 8 Miles

LEGEND
- Springs
- Caves
- Cody Scarp
- County Line
- Approximate Basin Boundary

November 2005

# Performance-Based Nutrient Reduction Systems:
## What they are, What they can do, and Procedures for Permitting

Eberhard Roeder, Ph.D., P.E.
Bureau of Onsite Sewage Programs
Florida Department of Health

Florida Wastewater Summit 01/11/2007

HEALTH

## The Performance-Based Regulatory Approach

- **If you build it this way, we believe that it will work (construction/design standards)**

  **Versus**

- **Build it how you want, as long as it works (performance standards)**

- **Requires:**
  - Assurance that it can work (application of sound engineering principles, and data)
  - Confirmation that it does work (Monitoring)

HEALTH

## Performance-based Treatment Systems What They Are.....

- **a specialized onsite sewage treatment and disposal system**
- **achieve a specific and measurable established performance standard of**
  - **CBOD5 (carbonaceous biochemical oxygen demand),**
  - **TSS (total suspended solids),**
  - **TN (total nitrogen),**
  - **TP (total phosphorus), and**
  - **fecal coliform**
- **designed by a professional engineer with a background in wastewater engineering**
- **64E-6.025(10) F.A.C**

HEALTH

## Performance-based Treatment Systems What They Are.....

- Aids in resolving variance issues by providing consistent solutions to similar problems.
- Encourages designs that fit the site.
- Provides performance improvement to allow reduced setbacks and separations.
- Provides a method for implementing research project results into current designs as early as possible. Continual Improvement concept.

HEALTH

PERFORMANCE STANDARDS

| POLLUTANT | BASELINE SYSTEM STANDARDS (Septic tank effluent) | BASELINE SYSTEM STANDARDS (@ base of 24 inch unsaturated zone) | AEROBIC TREATMENT UNIT (effluent) | SECONDARY TREATMENT STANDARDS (effluent) | ADVANCED SECONDARY TREATMENT STANDARDS (effluent) | ADVANCED WASTEWATER TREATMENT STANDARDS (effluent) |
|---|---|---|---|---|---|---|
| $CBOD_5$ (Carbonaceous Biochemical Oxygen Demand) | 120-240 mg/l | < 5 mg/l | =or< 30 mg/l | =or< 20 mg/l | =or< 10 mg/l | =or< 5 mg/l |
| TSS (Total Suspended Solids) | 88-176 mg/l | < 5 mg/l | =or< 30 mg/l | =or< 20 mg/l | =or< 10 mg/l | =or< 5 mg/l |
| TN (Total Nitrogen) | 36-45 mg/l | 15-25 mg/l | not applicable | not applicable | =or< 20 mg/l | =or< 3 mg/l |
| TP (Total Phosphorus) | 6-10 mg/l | < 5 mg/l | not applicable | not applicable | =or< 10 mg/l | =or< 1 mg/l |
| Fecal coliform | | undetected | not applicable | =or< 200 fc col/100 ml | =or<200 fc col/100 ml | BDL for 100 ml |
| DRAINFIELD REDUCTIONS (CBOD5 and TSS) | not applicable | not applicable | 25% in slightly limited soil | 25% | 30% | 40% |
| INCREASED AUTHORIZED FLOWS | no change | no change | no change | 25% | 50% | 100% |

## $CBOD_5$ =Carbonaceous Biochemical Oxygen Demand in five days

- Typical septic tank effluent = 120-240 mg/l.
- Reduced by aerobic action in either aerated tanks or unsaturated media filtering.
- Can be reduced to ≤ 5 mg/l by pre-treatment.
- Causes drainfield clogging and failure

HEALTH

## TSS =Total Suspended Solids

- Typical septic tank effluent = 65-176 mg/l
- Reduced by aerobic treatment and passing through filters
- Can be reduced to ≤ 5 mg/l by pre-treatment
- Florida Restaurant Study indicated maximum *BIOLOGICAL* loading ($CBOD_5$+TSS) rate of .0015 lbs/sq ft/day, beyond which drainfield failures became common

## NITROGEN

- Typical septic tank effluent = 36-45 mg/l
  (possibly increasing to ~60 mg/L)
- Limiting nutrient frequently in coastal waters and freshwater springs
- Exists in various forms and must be dealt with progressively in each form to insure removal

## Nitrogen Transformations

- 1) Ammonification in the septic tank to **ammonia**

  Organic Nitrogen + microorganisms
  -> $NH_3/NH_4^+$ + microorganisms

- 2) Nitrification to **nitrate** in the presence of oxygen, using ammonia as food (drainfield or aeration tank)

  $NH_4^+ + 2O_2 \rightarrow NO_3^- + 2\,H^+ + 2\,H_2O$

## Nitrogen Transformations

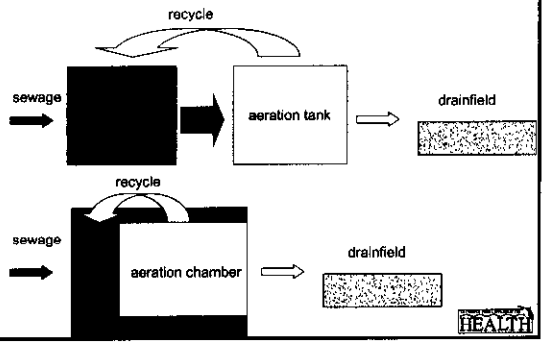
- 3) The Nitrogen removal step: Denitrification to **nitrogen gas**

  $NO_3^-$ + organic matter (no air)-> $N_2$ + $CO_2$ + $OH^-$ + $H_2O$

- Problem: little organic matter left after drainfield or aeration tank
- Solutions (Advanced (secondary) wastewater treatment in onsite systems):
  - Recirculate nitrate-rich effluent to sewage rich in organic matter (septic tank/septic tank effluent)
  - Add organic matter/food (under development)

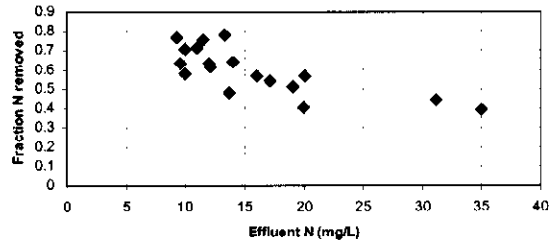
HEALTH

## Examples for Nitrogen Removal Processes




HEALTH

## Review of third-party Nitrogen Removal Data in Bureau Files




HEALTH

## NITROGEN

- 80% removal or 9 mg/L appears to be the limit that can be achieved with recirculation alone
- 50% removal is frequently achieved with a variety of techniques
- Extended Aeration ATU gets about 25% removal, similar to drainfield
- System designs are improving regularly
- Regular maintenance is essential

## PHOSPHORUS

- Typical septic tank effluent = 6-10 mg/l
- Does not transport easily through soil
- Along with nitrogen, encourages plant growth in water.
- Limiting nutrient frequently in freshwater lakes (e.g. Okeechobee), also Florida Keys
- Keys Onsite Nutrient Reduction Study evaluated drainfield media: crushed Cherokee-Sanford brick reduced TP to <1 mg/L.

## Fecal Coliform

- Typical septic tank effluent = loaded!
- Significantly reduced by pre-treatment.
- Values $\leq$ 200 fecal coliform colonies per 100 ml are common with simple pre-treatment
- Undetected when filtered through 24" of typical Florida soil

## PBTS Permitting Process

- Engineer defines design goals and pollutants of concern for this installation. For example:
  - drainfield size reduction (small lot): $CBOD_5$ and TSS
  - authorized lot flow, setback distances: all parameters
  - Florida Keys: all parameters
  - nitrogen sensitive area (springs area): nitrogen
  - shellfish harvesting area: fecal coliform
- Application addresses these concerns.

HEALTH

## Permit Review

- Normal review process with the addition of the performance review
- County Health Department or State Health Office checks for completeness
- CHD and State Office work together to complete the review.
- Memo HSES 02-022 provides a checklist. (http://www.doh.state.fl.us/environment/ostds/pdfiles/memos/2002/02-022.pdf)

HEALTH

## Permit Review

- Innovative Systems:
  - employ materials, devices, or techniques that are novel or unique and that have not been successfully field-tested ... in this state (381.0065(2)(g))
  - Require NSF Environmental Technology Verification data for approval
- Relationship to Variance Process
  - Statutory authority and requirement to approve single-family residence PBTS (381.0065(4)(j))
  - Statutory authority to approve innovative system in conjunction with a PBTS (381.0065(4)(k))
  - Others need to go through variance process

HEALTH

## Operation and Maintenance

- County Health Department issues operating permit for system to a maintenance entity
- Maintenance entity visits system at least twice a year
- County Health Department visits system once a year
- Sampling required for some systems (large ATUs, increased authorized flow, or reduced setback)

HEALTH

## CONCLUSIONS

- Properly designed, installed, and maintained systems can provide the protection required to protect public health and the environment.
- Site requirements and surrounding influenced areas need to be defined and systems designed to meet those requirements.

HEALTH

DIVISION OF
**Environmental Health**

HEALTH